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DOES THE PHILIPS CURVE EXIST? : Cross-Section Evidences from Allover the World

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A B S T R A C T

This paper provides evidences that the Philips curve exists in the world's economy. The Philips curve depicted a negative correlation between the rate of inflation and unemployment rate. This dilemma has been a big problem faced by any government. Inflation cannot be eliminated without raising unemployment, at least for some time and moderate unemployment cannot be cut sharply without the risk of raising inflation. It was empirically evidence that this curve exist in the short-run. Inflation cannot be reduced without creating a recession. Using cross-section data on inflation rate and rate of unemployment from 182countries all over the world: 49 countries in Asia, 52 countries in Africa, 39 countries in Europe and 29 countries in America, this paper proved that there was a negative correlation between the rate of inflation and unemployment rate. It means that the Philipscurve do exists in economy, but the relationship between them was not statistically significant.

INTRODUCTION

In economics, inflation is a sustained increase in the general price level of goods and services in an economy over a period of time (Blanchard, 2000; Dornbusch & Fischer, 1994). When the price level rises, each unit of currency buys fewer goods and services. Consequently, inflation reflects a reduction in the purchasing power per unit of money – a loss of real value in the medium of exchange and unit of account within the economy (Walgenbach, P.H., *et.al*., 1973). A chief measure of price inflation is the inflation rate, the annualized percentage change in a general price index, usually the consumer price index, over time (Mankiw, 2002). Inflation affects economies in various positive and negative ways. The negative effects of inflation include an increase in the opportunity cost of holding money, uncertainty over future inflation which may discourage investment and savings, and if inflation were rapid enough, shortages of goods as consumers begin hoarding out of concern that prices will increase in the future. Positive effects include reducing the real burden of public and private debt, keeping nominal interest rates above zero so that central banks can adjust interest rates to stabilize the economy, and reducing unemployment due to nominal wage rigidity (Mankiw, 2002).

Economists generally believe that high rates of inflation and hyperinflation are caused by an excessive growth of the money supply (Barro & Grilli, 1994). However, money supply growth does not necessarily cause inflation. Some economists maintain that under the conditions of a liquidity trap, large monetary injections are like "pushing on a string" (Makin, 2010; Krugman & Eggertsson, 2014). Views on which factors determine low to moderate rates of inflation are more varied. Low or moderate inflation may be attributed to fluctuations in real demand for goods and services, or changes in available supplies such as during scarcities. However, the consensus view is that a long sustained period of inflation is caused by money supply growing faster than the rate of economic growth (Mankiw, 2002; Abel & Bernanke, 2005).

Today, most economists favor a low and steady rate of inflation (Hummel, 2007). Low inflation reduces the severity of economic recessions by enabling the labor market to adjust more quickly in a downturn, and reduces the risk that a liquidity trap prevents monetary policy from stabilizing the economy (Lars, 2003). The task of keeping the rate of inflation low and stable is usually given to monetary authorities. Generally, these monetary authorities are the central banks that control monetary policy through the setting of interest rates, through open market operations, and through the setting of banking reserve requirements (Taylor, 2008).

Unemployment occurs when people who are without work are actively seeking paid work (ILO, 1982). The unemployment rate is a measure of the prevalence of unemployment and it is calculated as a percentage by dividing the number of unemployed individuals by all individuals currently in the labor force. During periods of recession, an economy usually experiences a relatively high unemployment rate (ILO, 2013). According to International Labour Organization (2013) report, more than 200 million people globally or 6% of the world's workforce were without a job in 2012.

There remains considerable theoretical debate regarding the causes, consequences and solutions for unemployment. Classical economics, New classical economics, and the Austrian School of economics argue that market mechanisms are reliable means of resolving unemployment. These theories

argue against interventions imposed on the labor market from the outside, such as unionization, bureaucratic work rules, minimum wage laws, taxes, and other regulations that they claim discourage the hiring of workers.Keynesian economics emphasizes the cyclical nature of unemployment and recommends government interventions in the economy that it claims will reduce unemployment during recessions. This theory focuses on recurrent shocks that suddenly reduce aggregate demand for goods and services and thus reduce demand for workers. Keynesian models recommend government interventions designed to increase demand for workers; these can include financial stimuli, publicly funded job creation, and expansionist monetary policies. Its namesake, economist John Maynard Keynes, believed that the root cause of unemployment is the desire of investors to receive more money rather than produce more products, which is not possible without public bodies producing new money (Dornbusch & Fisher, 1994).

The Phillips curve is a single-equation empirical model, named after A. W. Phillips, describing a historical inverse relationship between rates of unemployment and corresponding rates of inflation that result within an economy. Stated simply, decreased unemployment, in an economy will correlate with higher rates of inflation.While there is a short run tradeoff between unemployment and inflation, it has not been observed in the long run (Chang, 1997). In 1968, Milton Friedman asserted that the Phillips curve was only applicable in the short-run and that in the long-run, inflationary policies will not decrease unemployment (Friedman, 1968*;* Phelan, 2012). Friedman then correctly predicted that, in the 1973–75 recession, both inflation and unemployment would increase (Phelan, 2012). The long-run Phillips Curve is now seen as a vertical line at the natural rate of unemployment, where the rate of inflation has no effect on unemployment.Accordingly, the Phillips curve is now seen as too simplistic, with the unemployment rate supplanted by more accurate predictors of inflation based on velocity of moneysupply measures such as the MZM ("money zero maturity") velocity, which is affected by unemployment in the short but not the long term (Hossfeld, 2010).

This paper is aimed to examine the existence of Philips curve in the world's economy using cross section data from Asian economies (49 countries, African economies (52 countries), European economies (39 countries) and American economies (29 countries).

LITERATURE REVIEWS

Inflation

The term "inflation" originally referred to increases in the amount of money in circulation (Chisholm, ed., 1922) and some economists still use the word in this way. However, most economists today use the term "inflation" to refer to a rise in the price level. An increase in the money supply may be called monetary inflation, to distinguish it from rising prices, which may also for clarity be called "price inflation". Economists generally agree that in the long run, inflation is caused by increases in the money supply.

Conceptually, inflation refers to the general trend of prices, not changes in any specific price. For example, if people choose to buy more cucumbers than tomatoes, cucumbers consequently become more expensive and tomatoes cheaper. These changes are not related to inflation, they reflect a shift in tastes. Inflation is related to the value of currency itself. When currency was linked with the gold, if new gold deposits were found, the price of gold and the value of currency would fall, and consequently prices of all other goods would become higher. Rapid increases in quantity of the money or in the overall money supply (or debasement of the means of exchange) have occurred in many different societies throughout history, changing with different forms of money used (Dobson, 2002 ;Harl, 1996). For instance, when gold was used as currency, the government could collect gold coins, melt them down, mix them with other metals such as silver, copper or lead, and reissue them at the same nominal value. By diluting the gold with other metals, the government could issue more coins without also needing to increase the amount of gold used to make them. When the cost of each coin is lowered in this way, the government profits from an increase in seigniorage. This practice would increase the money supply but at the same time the relative value of each coin would be lowered. As the relative value of the coins becomes lower, consumers would need to give more coins in exchange for the same goods and services as before. These goods and services would experience a price increase as the value of each coin is reduced.

Song Dynasty China introduced the practice of printing paper money in order to create fiat currency (von Glahn., 1996*)*. During the Mongol Yuan Dynasty, the government spent a great deal of money fighting costly wars, and reacted by printing more money, leading to inflation (Ropp, 2010). Fearing the inflation that plagued the Yuan dynasty, the Ming Dynasty initially rejected the use of paper money, and reverted to using copper coins (Bernholz, 2003).

Historically, large infusions of gold or silver into an economy also led to inflation. From the second half of the 15th century to the first half of the 17th, Western Europe experienced a major inflationary cycle referred to as the "price revolution" (Hamilton, 1934; Munro, 2009) with prices on average rising perhaps sixfold over 150 years. This was largely caused by the sudden influx of gold and silver from the New World into Habsburg Spain (Walton, 1994*)*. The silver spread throughout a previously cash-starved Europe and caused widespread inflation (Tracy, J.D., 1994*)*. Demographic factors also contributed to upward pressure on prices, with European population growth after depopulation caused by the Black Death pandemic.By the nineteenth century, economists categorized three separate factors that cause a rise or fall in the price of goods: a change in the value or production costs of the good, a change in the price of money which then was usually a fluctuation in the commodity price of the metallic content in the currency, and currency depreciation resulting from an increased supply of currency relative to the quantity of redeemable metal backing the currency. Following the proliferation of private banknote currency printed during the American Civil War, the term "inflation" started to appear as a direct reference to the currency depreciation that occurred as the quantity of redeemable banknotes outstripped the quantity of metal available for their redemption. At that time, the term inflation referred to the devaluation of the currency, and not to a rise in the price of goods.

This relationship between the over-supply of banknotes and a resulting depreciation in their value was noted by earlier classical economists, who would go on to examine and debate

what effect monetary inflation has on the price of goods,later termed as inflation.

The inflation rate is widely calculated by calculating the movement or change in a price index, usually the consumer price index (Blanchard, 2000). The inflation rate is the percentage rate of change of a price index over time. The Retail Prices Index is also a measure of inflation that is commonly used in the United Kingdom. It is broader than the CPI and contains a larger basket of goods and services.To illustrate the method of calculation, in January 2007, the U.S. Consumer Price Index was 202.416, and in January 2008 it was 211.080. The formula for calculating the annual percentage rate inflation in the CPI over the course of the year is: The resulting inflation rate for the CPI in this one-year period is 4.28%, meaning the general level of prices for typical U.S. consumers rose by approximately four percent in 2007. Other widely used price indices for calculating price inflation include Producer Price Indices (PPIs) and Commodity Price Indices (CPI). PPIs measures average changes in prices received by domestic producers for their output. This differs from the CPI in that price subsidization, profits, and taxes may cause the amount received by the producer to differ from what the consumer paid. There is also typically a delay between an increase in the PPI and any eventual increase in the CPI. Producer price index measures the pressure being put on producers by the costs of their raw materials. This could be "passed on" to consumers, or it could be absorbed by profits, or offset by increasing productivity. In India and the United States, an earlier version of the PPI was called the Wholesale Price Index. Commodity price indices measure the price of a selection of commodities. In the present commodity price indices are weighted by the relative importance of the components to the "all in" cost of an employee.

Unemployment

The state of being without any work both for educated & uneducated person for earning one's livelihood is meant by unemployment. Economists distinguish between various overlapping types of and theories of unemployment, including cyclical or Keynesian unemployment, frictional unemployment, structural unemployment and classical unemployment. Some additional types of unemployment that are occasionally mentioned are seasonal unemployment, hardcore unemployment, and hidden unemployment.

Many economists have argued that unemployment increases with increased governmental regulation. For example, minimum wage laws raise the cost of some low-skill laborers above market equilibrium, resulting in increased unemployment as people who wish to work at the going rate cannotas the new and higher enforced wage is now greater than the value of their labor (Hayek,1960). *Laws* restricting layoffs may make businesses less likely to hire in the first place, as hiring becomes more risky (Anderton, 2006). However, this argument overly simplifies the relationship between wage rates and unemployment, ignoring numerous factors, which contribute to unemployment (Garegnani, 1970; Vienneau, 2005; Opocher Steedman, 2009; Anyadike-Danes & Godley, 1989; White, 2001). Some, such as Murray Rothbard, suggest that even social taboos can prevent wages from falling to the market-clearing level (Rothbard, 1963).

Vedder & Gallaway (1997) argue that the empirical record of wages rates, productivity, and unemployment in American validates classical unemployment theory. Their data shows a strong correlation between adjusted real wage and unemployment in the United States from 1900 to 1990. However, they maintain that their data does not take into account exogenous events.

Cyclical unemployment occurs when there is not enough aggregate supply in the economy to provide jobs for everyone who wants to work. Demand for most goods and services falls, less production is needed and consequently fewer workers are needed, wages are sticky and do not fall to meet the equilibrium level, and mass unemployment results (Keynes, 2007*).* Its name is derived from the frequent shifts in the business cycle. Keynesian economists see the lack of supply for jobs as potentially resolvable by government intervention. One suggested interventions involves deficit spending to boost employment and demand. Another intervention involves an expansionary monetary policy that increases the supply of money which should reduce interest rates which should lead to an increase in non-governmental spending (Harris, (2005).

Marxists also share the Keynesian viewpoint of the relationship between economic demand and employment, but with the caveat that the market system's propensity to slash wages and reduce labor participation on an enterprise level causes a requisite decrease in aggregate demand in the economy as a whole, causing crises of unemployment and periods of low economic activity before the capital accumulation (investment) phase of economic growth can continue (Marx, 1863*).* According to Karl Marx (2009), unemployment is inherent within the unstable capitalist system and periodic crises of mass unemployment are to be expected. The function of the proletariat within the capitalist system is to provide a "reserve army of labour" that creates downward pressure on wages. This is accomplished by dividing the proletariat into surplus labour and under-employment (Marx, 2009). This reserve army of labour fight among themselves for scarce jobs at lower and lower wages.According to Marx, the only way to permanently eliminate unemployment would be to abolish capitalism and the system of forced competition for wages and then shift to a socialist or communist economic system. For contemporary Marxists, the existence of persistent unemployment is proof of the inability of capitalism to ensure full employment.

There are also different ways national statistical agencies measure unemployment. These differences may limit the validity of international comparisons of unemployment data (Sorrentino, C., 2000). To some degree these differences remain despite national statistical agencies increasingly adopting the definition of unemployment by the International Labour Organization. To facilitate international comparisons, some organizations, such as the OECD, Eurostat, and International Labor Comparisons Program, adjust data on unemployment for comparability across countries.Though many people care about the number of unemployed individuals, economists typically focus on the unemployment rate. This corrects for the normal increase in the number of people employed due to increases in population and increases in the labour force relative to the population. The unemployment rate is expressed as a percentage, and is

calculated as: unemployment rate = (unemployment workers/total labour force) x 100%.

As defined by the International Labour Organization, "unemployed workers" are those who are currently not working but are willing and able to work for pay, currently available to work, and have actively searched for work. Individuals who are actively seeking job placement must make the effort to be in contact with an employer, have job interviews, contact job placement agencies, send out resumes, submit applications, respond to advertisements, or some other means of active job searching within the prior four weeks. Simply looking at advertisements and not responding will not count as actively seeking job placement. Since not all unemployment may be "open" and counted by government agencies, official statistics on unemployment may not be accurate (Zuckerman, 2002*)*. In the United States, for example, the unemployment rate does not take into consideration those individuals who are not actively looking for employment, such as those still attending college (Coy, 2012).

The ILO describes 4 different methods to calculate the unemployment rate, namely : Labour Force Sample Surveys, Official Estimates, Social Insurance Statisticsand Employment Office Statistics.This method also includes unemployed who are not unemployed per the ILO definition.

Philips Curve

William Phillips (1958) wrote a paper untittle *The Relation between Unemployment and the Rate of Change of Money Wage Rates in the United Kingdom, 1861-1957*, which was published in the quarterly journal.In the paper Phillips describes how he observed an inverse relationship between money wage changes and unemployment in the British economy over the period examined. Similar patterns were found in other countries and Samuelson&Solow (1960) took Phillips' work and made explicit the link between inflation and unemployment: when inflation was high, unemployment was low, and vice versa.In the 1920s, an American economist Fisher (1973) noted this kind of Phillips curve relationship. However, Phillips' original curve described the behavior of money wages.In the years following Phillips' 1958 paper, many economists in the advanced industrial countries believed that his results showed that there was a permanently stable relationship between inflation and unemployment.One implication of this for government policy was that governments could control unemployment and inflation with a Keynesian policy. They could tolerate a reasonably high rate of inflation as this would lead to lower unemployment – there would be a trade-off between inflation and unemployment. For example, monetary policy and/or fiscal policy could be used to stimulate the economy, raising gross domestic product and lowering the unemployment rate. Moving along the Phillips curve, this would lead to a higher inflation rate, the cost of enjoying lower unemployment rates. Economist James Forder (2014) argues that this view is historically false and that neither economists nor governments took that view and that the 'Phillips curve myth' was an invention of the 1970s (Forder, 2014). Since 1974, seven Nobel Prizes have been given to economists for, among other things, work critical of some variations of the Phillips curve. Some of this criticism is based on the United States' experience during the 1970s, which had periods of high unemployment and high inflation at the same time. The authors receiving those prizes include Thomas Sargent, Christopher Sims, Edmund Phelps, Edward Prescott, Robert A. Mundell, Robert E. Lucas, Milton Friedman, and F.A. Hayek (Domitrovic, 2011).

Most economists no longer use the Phillips curve in its original form because it was shown to be too simplistic (Hossfeld, 2010). This can be seen in a cursory analysis of US inflation and unemployment data from 1953–92. There is no single curve that will fit the data, but there are three rough aggregations—1955–71, 1974–84, and 1985–92—each of which shows a general, downwards slope, but at three very different levels with the shifts occurring abruptly. The data for 1953–54 and 1972–73 do not group easily, and a more formal analysis posits up to five groups/curves over the period (Chang 1997). But still today, modified forms of the Phillips Curve that take inflationary expectations into account remain influential. The theory goes under several names, with some variation in its details, but all modern versions distinguish between short-run and long-run effects on unemployment. Modern Phillips curve models include both a short-run Phillips Curve and a long-run Phillips Curve. This is because in the short run, there is generally an inverse relationship between inflation and the unemployment rate; as illustrated in the downward sloping short-run Phillips curve. In the long run, that relationship breaks down and the economy eventually returns to the natural rate of unemployment regardless of the inflation rate (Reed, 2016).

The "short-run Phillips curve" is also called the "expectations-augmented Phillips curve", since it shifts up when inflationary expectations raise (Friedman, M., 1968). In the long run, this implies that monetary policy cannot affect unemployment, which adjusts back to its "natural rate", or "long-run Phillips curve". However, this long-run "neutrality" of monetary policy does allow for short run fluctuations and the ability of the monetary authority to temporarily decrease unemployment by increasing permanent inflation, and vice versa. The popular textbook of Blanchard (2000) gives a textbook presentation of the expectations-augmented Phillips curve. An equation like the expectations-augmented Phillips curve also appears in many recent New Keynesian dynamic stochastic general equilibrium models. In these macroeconomic models with sticky prices, there is a positive relation between the rate of inflation and the level of demand, and therefore a negative relation between the rate of inflation and the rate of unemployment. This relationship is often called the "New Keynesian Phillips curve". Like the expectations-augmented Phillips curve, the New Keynesian Phillips curve implies that increased inflation can lower unemployment temporarily, but cannot lower it permanently. Two influential papers that incorporate a New Keynesian Phillips curve Galí & Gertler (1999), and Blanchard & Galí (2007).

DATA AND METHOD OF ANALYSIS

Data for this cross-section study were collected from http://www.tradingeconomics.com/ country-list/inflation-rate for inflation rate data and from http://www. tradingeconomics. com/ country-list/unemployment-ratefor unemployment rate data. In Asian data on inflation rate and unemployment rate were collected from 49 countries. In Africa, data on inflation rate and unemployment rate were collected from 52 countries, in Europe data on inflation rate and unemployment rate were collected from 39 countries and

in America data on inflation rate and unemployment rate were collected from 29 countries.

To prove the existence of the Philips curve in each economy, regression analysis was employed. If Y = inflation rate, and X = unemployment rate, the $y= x^{-e}$, so ln Y = -ln X, as data of Y and X were available, regression analysis could easily be calculated. Regression coefficients and their t-statistic were then analyzed to prove the existence of the Philips curve.

RESULTS AND DISCUSSION

In Asian countries, the scatter diagram between inflation rate and the rate of unemployment (49 countries) is presented in Figure 1. Regression analysis between inflation rate (%) and the rate of unemployment (%) showed that there was a negative relation between them, as indicated by a negative regression coefficient (-0.04). This correlation was not statistically significant as P-value more than 0.05 and t-statistics (-0.22) less than t-table (2.02 at 95% confident level, n=49).

Figure 2 presents the scatter diagram between inflation rate and the rate of unemployment in Africa (52 countries). Regression analysis between inflation rate (%) and the rate of unemployment (%) showed that there was a negative relation between them, as indicated by a negative regression coefficient (-2.17). This correlation was not statistically significant as P-value more than 0.05 and t-statistics (-0.32) less than t-table (2.01 at 95% confident level, n=52).

In European countries, the scatter diagram between inflation rate and the rate of unemployment (39 countries) is presented in Figure 3. Regression analysis between inflation rate (%) and the rate of unemployment (%) showed that there was a negative relation between them, as indicated by a negative regression coefficient (-0.12). This correlation was not statistically significant as P-value more than 0.05 and t-statistics (-2.14) less than t-table (2.03, at 95% confident level, n=39).

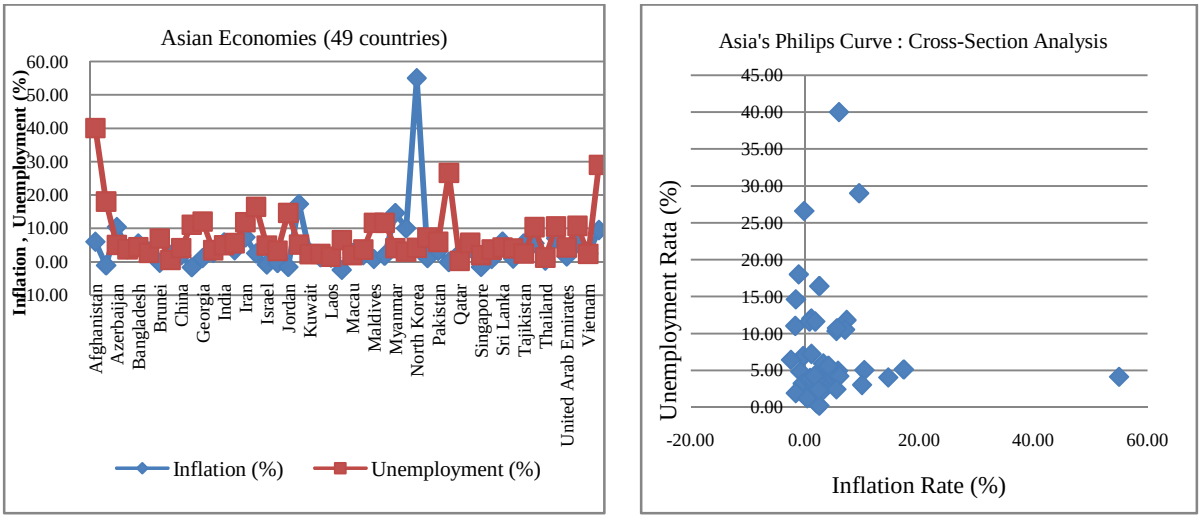

Figure 1. Inflation Rate, Unemployment Rate andthe Scatter Diagram to Predict The Existence of the Philips Curve in the Asian Economies

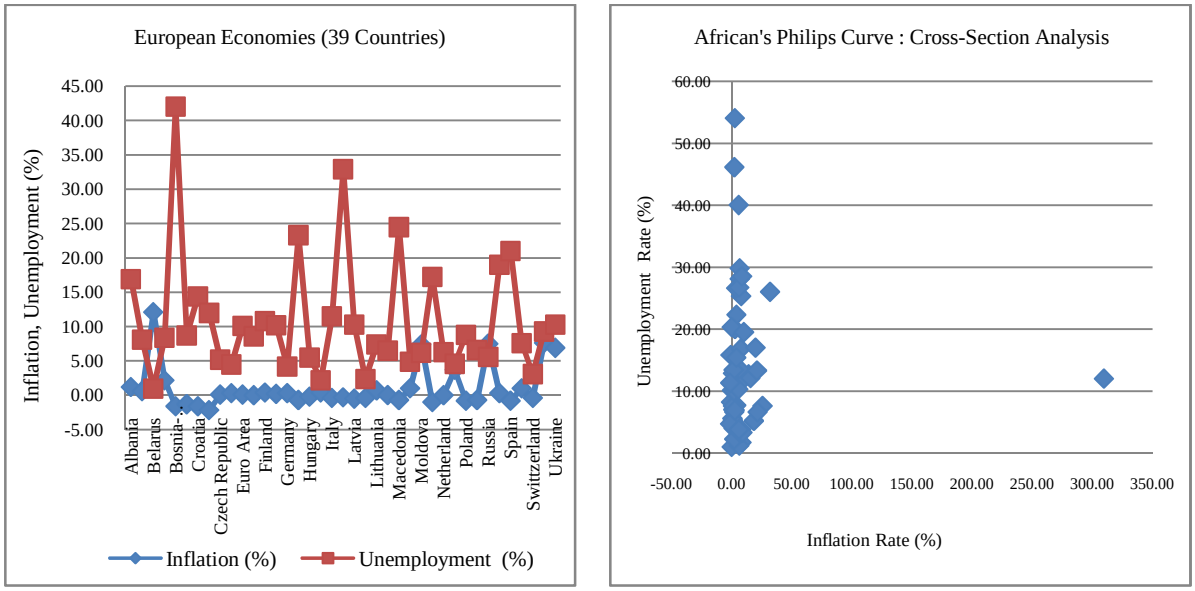

Figure 2 Inflation Rate, Unemployment Rate and the Scatter Diagram to Predict the Existence of the Philips Curve in the African Economies

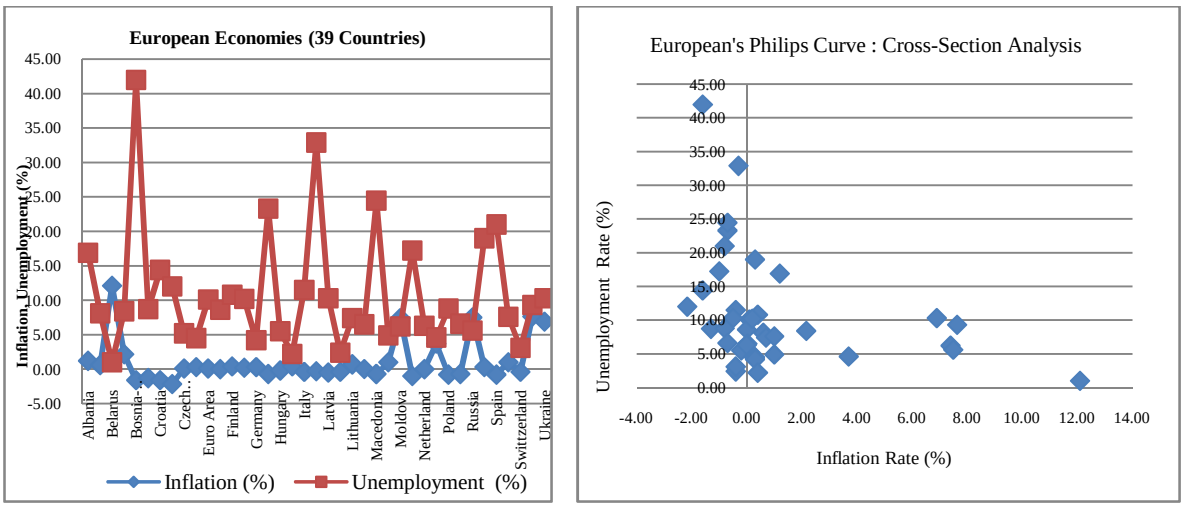

Figure 3 Inflation Rate, Unemployment Rate and the Scatter Diagram to Predict the Existence of Philips Curve in the European Economies

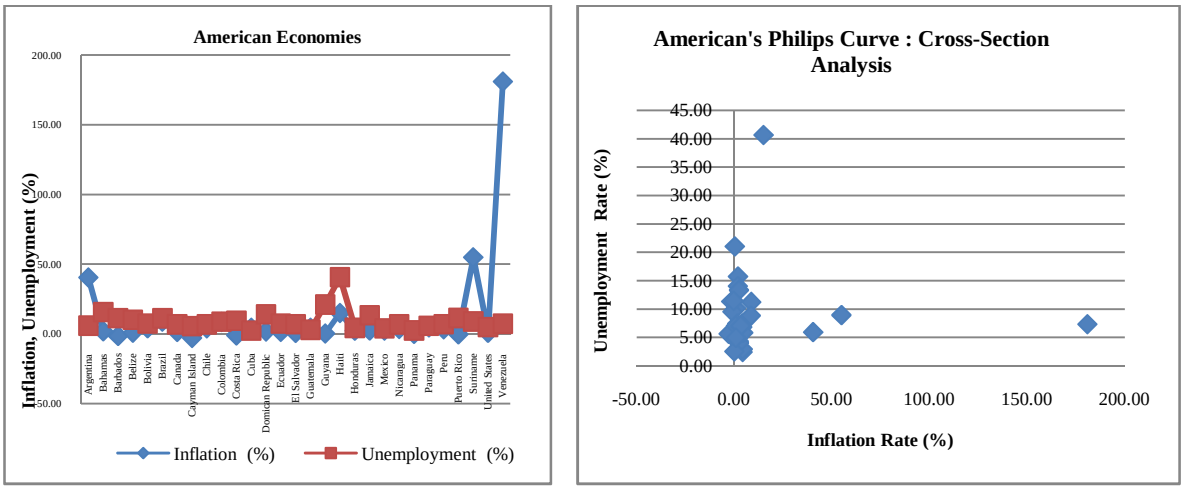

Figure 4 Inflation Rate, Unemployment Rate and the Scatter Diagram to Predict the Existence of the Philips Curve in the American Economies

Figure 4 presents the scatter diagram between inflation rate dan the rate of unemployment in the American economies (29 countries). Regression analysis between inflation rate (%) and the rate of unemployment (%) showed that there was a negative relation between them, as indicated by a negative regression coefficient (-0.64).

This correlation was not statistically significant as P-value more than 0.05 and t-statistics (-0.06) less than t-table (2.05 at 95% confident level, n=29).

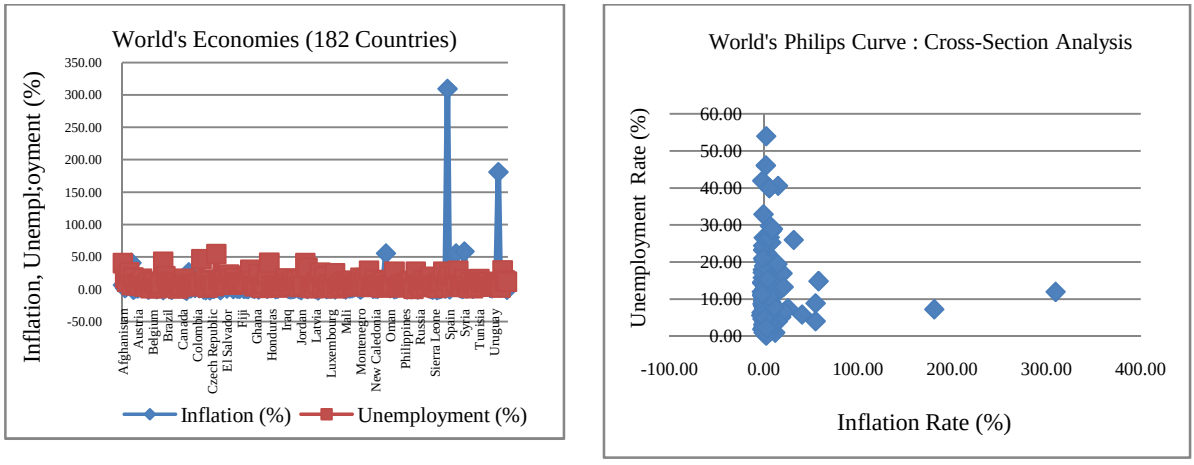

Figure 5 Inflation Rate, Unemployment Rate and the Scatter Diagram to Predict The Existence of the Philips Curve in the World's Economies

Finally, Figure 5 provides scatter diagram between inflation rate and the rate of unemployment for all over the world's economies (182 countries). Regression analysis between inflation rate (%) and the rate of unemployment (%) showed that there was a negative relation between them, as indicated by a negative regression coefficient (-1.59). This correlation was not statistically significant as P-value more than 0.05 and t-statistics (-0.67) less than t-table (1.96 at 95% confident level, n=182).

CONCLUSION

It could be concluded that firstly the Philips curve exist in Asian economies as indicated by a negative correlation between the rate of inflation and the inflation rate.The regression coefficient was -0.04; t-test showed that the regression coefficient was not statistically significant. Secondly, in African economies, the Philip curve also exists as there was a negative correlation between the rate of inflation and the inflation rate. The regression coefficient was -2.17; t-test showed that the regression coefficient was not statistically significant. Thirdly, in European countries, the Philip curve also exists as there was a negative correlation between the rate of inflation and the inflation rate. The regression coefficient was -0.12; t-test showed that the regression coefficient was not statistically significant. Fourthly, in American economy, the Philip curve also exists as there was a negative correlation between the rate of inflation and the inflation rate. The regression coefficient was -0.64; t-test showed that the regression coefficient was not statistically significant. Finally, it could be concluded that the Philip curve does exists in the world's economy, but the existence was not statistically significant.

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